

**Thomas Jefferson to William Dunbar, March 13,  
1804, from Thomas Jefferson and Early Western  
Explorers, Transcribed and Edited by Gerard W. Gawalt,  
Manuscript Division, Library of Congress**

**Thomas Jefferson to William Dunbar**

Washington Mar. 13. 04.

Dear Sir

Your favor of Jan. 28. has been duly recieved, and I have rad with great satisfaction your ingenious paper on the subject of the Misisipi which I shall immediately forward to the Philosophical society, where it will be duly prised to prove the value I set on it, & my wish that it may go to the public without any imperfection about it, I will take the liberty of submitting to your reconsideration the only passage which I think may require it. You say, page 9. The velocity of rivers is greatest at the surface, and gradually diminishes downwards' and this principle enters into some subsequent parts of the paper, and has too much effect on the phaenomena of that river not to merit mature consideration. I cannot but suppose it at variance with the law of motion in rivers. In strict theory the velocity of water at any given depth in a river is (in addition to it's velocity at it's surface) whatever a body would have acquired by falling thro' a space equal to that depth. If, in the middle of a river we drop a vertical line a.e. from it's surface to it's bottom, and (using a perch, or rather a measure of 16.125f for our unit of measure) we draw at the depths b.c.d.e. ( which suppose=1.4.9.16 perch) ordinates, in the direction of the stream to the odd numbers 3.5.7.9 perch, these ordinates will represent the additional velocities of the water, per second of time, at the depth of their respective abscissae, and will terminate in a curve of f.g.h.i, which will represent the velocity of the current in every point, and th

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wholemass of water passing on in a second of time\*. \*These Ordinates are Arimetical progressionals, each of which is double the root of it's Abussa plus Unit. The equation therefore expressing the law of the curve is  $y=2nx+1$ . That is the velocity of the water at any depth will be double the root of that depth, plus Unit. Were the line a.e. a wall, and by cg.dh.ei. troughs along which water spouted from apertures at b.c.d.e. their intersections with the curve at g.g.h.i. would mark the point in each trough to which the water would flow in a second of time, abating for friction. This would be the theory of the motion of rivers. Were there no friction, but the bottom being rough it's friction with the lower sheet or lamina of water will retard that lamina, the friction or viscosity of the particles of which again with those of the one next above will retard that, somewhat less, the 2d retard the 3d the 3d the 4th and so on upwards diminish

ing till the retardation becomes insensible, & the theoretic curve will be modified by that cause as at n.o. removing the maximum of motion from the bottom somewhere upwardly. Again the same circumstances of friction & viscosity of the particles of water among themselves will cause the lamina at the surface to be accelerated by the quicker motion of the one next below it; the 2d still more by the 3d the 3d by the 4th & so on downwards, the acceleration always increasing till it reaches the lamina of greatest motion the exact point of the maximum of motion cannot be calculated because it depends on friction, but it is probably much nearer the bottom than top, because the greater power of the current there sooner overcomes the effect of the friction. Ultimately the curve will be sensibly varied by being swelled outwardly above, and retracted inwardly below, somewhat like a.k.l.m.n.o in the preceding diagram.

Indulging corollaries on this theory, let us suppose a place surface, as a large sheet of cast iron let down by a cable from a boat, and made to present it's surface to the current by a long vane fixed on it's axis in the direction of the current. Would not the current below laying hold of this plate draw the boat down the stream with more rapidity than that with which it otherwise moves on the surface of the water? Again at the cross current of the surface, which flows into the Chafalusa and endangers the drawing boats into that river,

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as you mention pa.18. would not the same plane surface if let down into the under current, which moves or the direction of the bed of the main river have the effect of drawing the vessel across the lateral current prevailing at it's surface, and conduct the boat with safety, along the channel of the river? The preceding observations are submitted to your consideration by drawing your attention to the subject, they will enable you, on further reflection, to confirm or correct your first opinion. If the latter, there would be time, before we print a volume to make any alterations or additions to your paper which you might wish.

We were much indebted for your communications on the subject of Louisiana. The substance of what was recieved from you as well as other particulars came, as some were of a nature to excite illwill. Of these publications I sent you a copy. On the subject of the limits of Lousiana nothing was said therein, because we thought it best first to have explanations with Spain. In the first visit, after recieving the treaty, which I paid to Monticello, which was in August, I availed myself of what I have there to investigate the limits. While I was in Europe I had purchased every thing I could lay my hands on which related to any part of America, and particularly had a pretty full collection of the English, French & Spanish authors on the subject of Louisiana. The information I got from these was entirely satisfactory, and I threw it into a shape which would easily take the form of a Memorial. I now inclose you a copy of it. One single fact in it was taken from a publication in a newspaper supposed to be written by Judge Bais who had lived in West Florida. This asserted that the country was to think from the Iberville to the Perdido was to this day called Louisiana, and a part of the government of Lousiana. I write to you to ascertain that fact, and recieved the information you were so kind as to send me, on the reciept of which I changed the form of the assertion, so as to adapt it to what I suppose to be the fact, and to reconcile the testimony I have recieved to wit that th' the name & division of W. Florida have been retained, and instictness that country is now called by that name, yet it is also called Louisiana in common parlance, & even in some authentic public documents. The fact however is not of much importance, it would only have been an argumentum ad

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hominem. Altho' I would wish the paper inclosed never to be seen by anybody but yourself & that it should not even

be mentioned that the facts and opinions therein stated are founded in public authority yet I have no objections to their being freely advanced in conversation and as private & individual opinion, believing it will be advantageous that the extent of our rights should be known to the inhabitants of the country and that however we may compromise on our Western limits we never shall on the Eastern.

I formerly acquainted you with the mission of Capt. Lewis up the Missouri and across from it's head to the Pacific. He takes about a dozen men with him is well provided with instruments, and qualified to give use the geography of the line he passes along with astronomical accuracy. He is now hutted opposite the mouth of the Missouri ready to enter it on the opening of the season. He will be at least two years on the expedition. I propose to charge the Surveyor general N. of Ohio with a survey of the Missisipi from it's source to the mouth of Ohio, & with settling some other interesting points of geography in that quarter. Congress will probably authorise me to explore the greater waters on the Western wide of the Missisipi & Missouri, to their sources. In this case I should propose to send one party up the Panis river to it's source, thence along the highlands to the source of the Padoucas river, and down it to it's mouth. Another party up the Arcansa to it's source, thence along the highlands to the source of the Red river, & down that to it's moth, giving the whole course of both parties corrected by astronomical observations. These several surveys will enable us to prepare a map of Louisiana, which in it's contour and main waters will be perfectly correct, & will give us a skeleton to be filled up with details hereafter. For what lies North of the Missouri we suppose British industry will furnish that. As you live so near to the point of departure of the lowest expedition, and possess and can acquire so much better the information which may direct that

to the best advantage, I have thought if congress should authorise the enterprise to propose to you the unprofitable trouble of directing it. The party would consist of 10 or

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12 picked souldiers, volunteers with an officer, under the guidance of one or two persons qualified to survey & correct by observations of latitude & longitude the latter lunar, and as well informed as we can get them in the departments of botany, natural history & mineralogy. I am told there is a Mr. Walker in your town & a Mr. Gillespie in N. Carolina possessing good qualifications. As you know them both, you can judge whether both are qualified, should two persons go, or which is best, should but one be sent, or whether there is any other person better qualified than either. Their pay would probably not exceed 1000D. a year, to which would be added their subsistence. All preparations would be to be made at Natchez & N. Orleans, & the necessary advances be furnished by the Collector of N. Orleans, on your order, to take this trouble no inducement could be proposed to you but the gratification of contributing to the promotion of science. Instructions similar to those of Capt. Lewis would go from here to be added to by what should occur to yourself, and you would be the center from the communications from the party to the government. Still this is a matter of speculation only, as Congress are hurrying over their business for adjournment, and may leave this article of it unfinished. In that case what I have said will be as if I had not said it.

There is such a difference of opinion in Congress as to the government to be given to Lousiana, that they may continue the present one another year. I hope and urge their not doing it & the establishment of a government on the spot, capable of meeting promptly it's own emergencies. Accept my friendly salutations & assurances of great esteem & respect.  
Th. Jefferson

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